MODELS OF STRUCTURES IN THE CATSKILL AQUEDUCT SYSTEM[1]

The Catskill water supply system has a number of complicated structures along its length of 120 miles. It was considered advisable to make models of certain types of these structures to serve not only as an aid to the operating force, which had nothing to do with the design or construction of the Catskill supply, but also as a means of enlightening the public and the engineering profession on some of the latest developments in water-supply engineering.

Moreover, since there occurs at times a reorganization of city departments with a change in administration, together with the normal changes in the personnel engaged on public works, these models will prove of special value to newly appointed heads and their subordinates in charge of operation and maintenance.

A large number of drawings were necessary for each of these complicated structures. In the case of the waterway and drainage Shaft 21 of the city aqueduct tunnel, figure 1, there were 85 contract drawings and 220 working drawings. Many of the features are either submerged or buried in concrete and consequently will be accessible rarely, if ever. To obtain a general conception of the construction and operation from plans involves a great expenditure of time and effort even for an engineer. The models succeed in giving a rapid and comprehensive idea of the construction and functions.

The scale of the models, $\frac{1}{4}$ inch to the foot, precluded the possibility of showing all the details of the drawings. However, all features essential in the construction and operation were brought out. This was accomplished by means of hinged sections or other suitable devices. Loose parts, susceptible of being lost or misplaced, were avoided. No uniform method of construction could be adopted, as each model was of a different type. The accompanying illustrations show a few of the models as built.

[1]Prepared at the request of the Committee on Publications by the Engineering Bureau of the Board of Water Supply, New York City. The models were exhibited at the meeting of the New York Section, October 16, 1918.

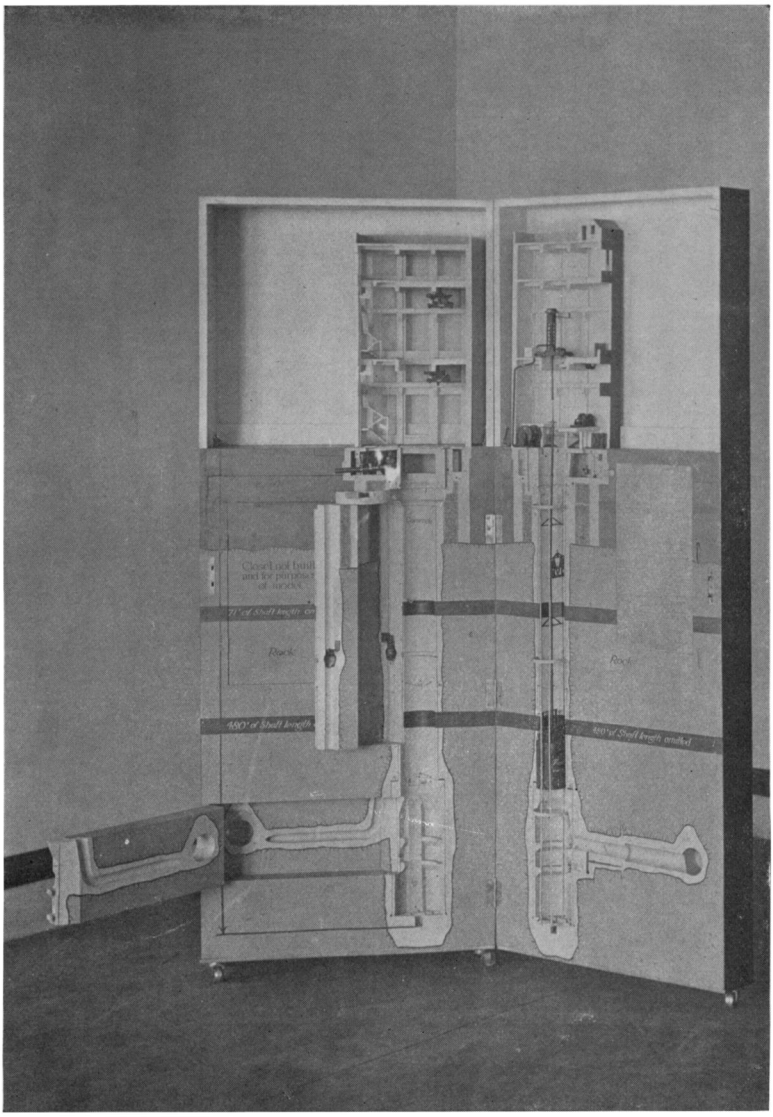

FIG. 1. MODEL OF SHAFT 21, CITY AQUEDUCT TUNNEL

Showing riser pipe, riser valve, valve chamber, superstructure, explanatory tablet and method of unwatering the pressure tunnel. This model has 22 hinged sections.

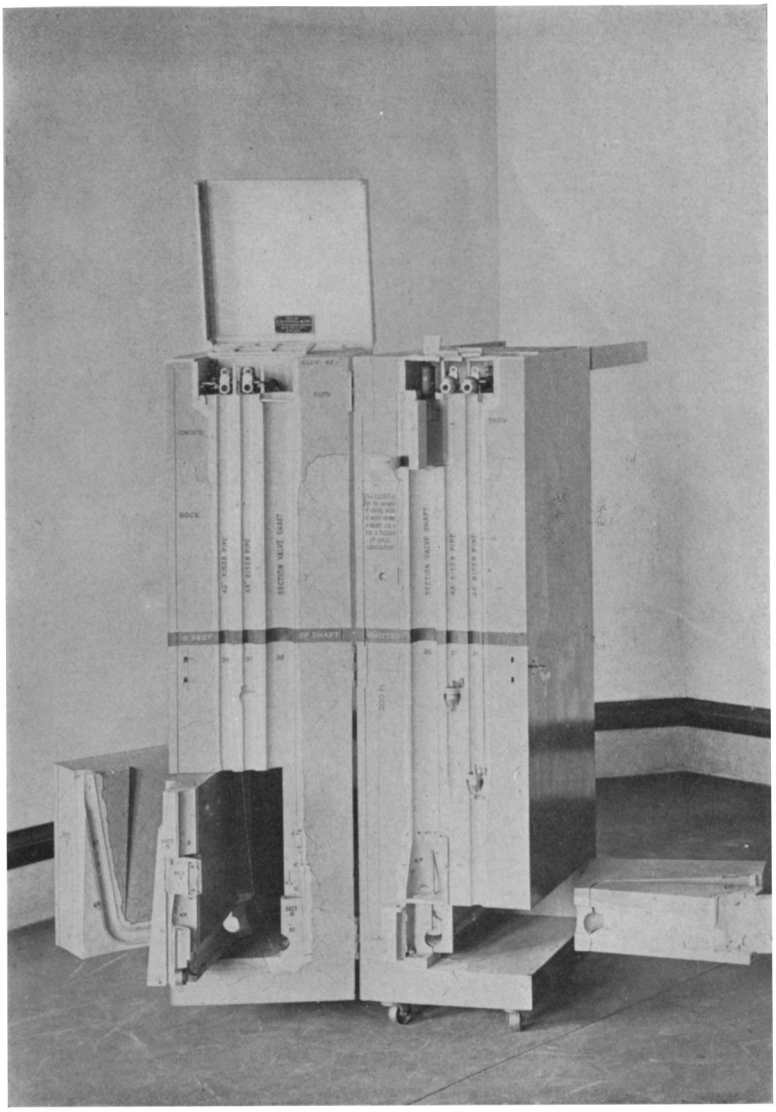

FIG. 2. MODEL OF SHAFT 18, CITY AQUEDUCT TUNNEL

Showing a typical section valve shaft, with riser pipes, riser valves and valve chamber. This model has 20 hinged sections.

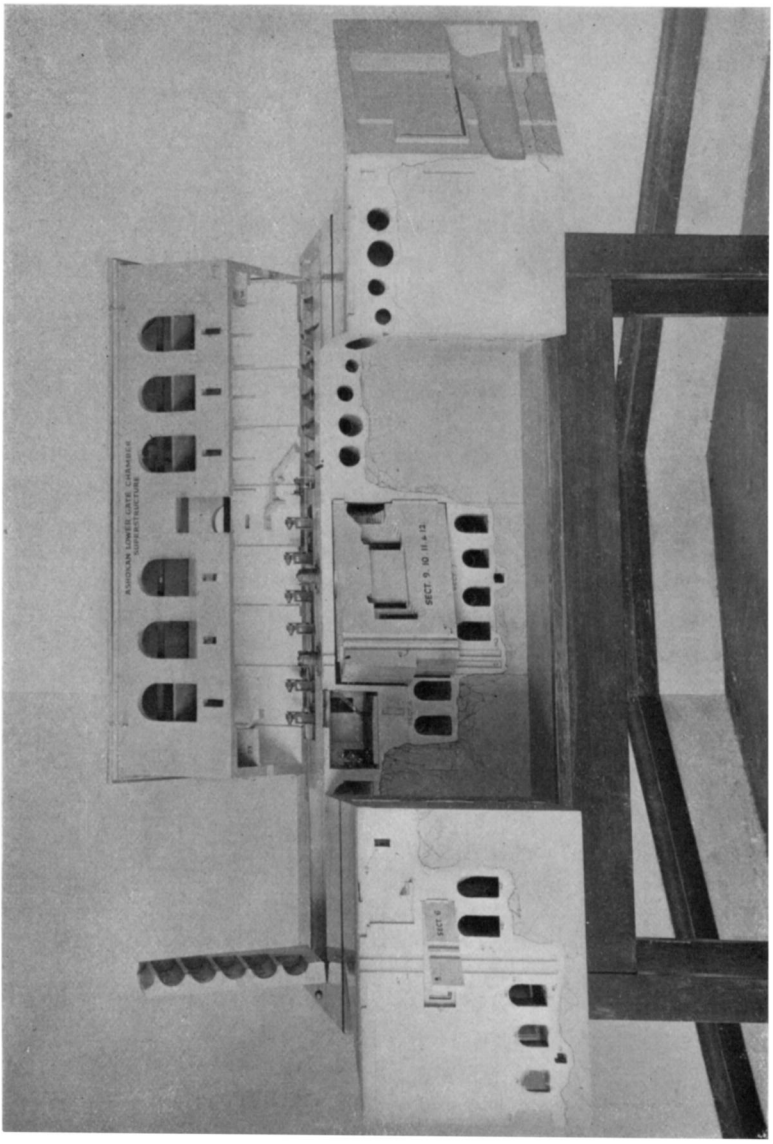

FIG. 3. MODEL OF ASHOKAN LOWER EFFLUENT CHAMBER

Showing the superstructure, operating floor, upper and lower special aqueducts, aerator pipes, passageways to gate wells, etc. There are 19 sections in the main body of the model.

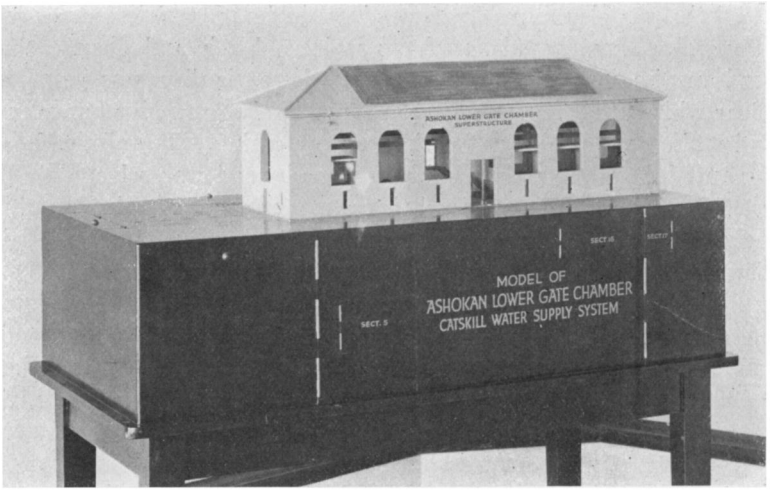

FIG. 4. MODEL OF ASHOKAN LOWER EFFLUENT CHAMBER

Showing all the sections in place and ready to receive the housing enclosing the upper portion of the model.

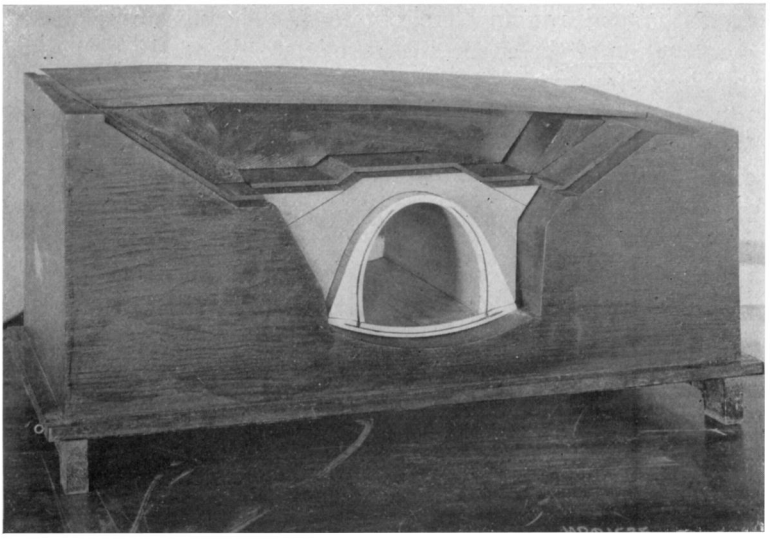

FIG. 5. MODEL OF A SECTION OF CUT-AND-COVER AQUEDUCT

Made in connection with a contractor's claim. It has 12 removable parts fitting into the body of the model.

All the models are made of wood, with the more delicate portions of metal. Hard woods, such as walnut, birch and cherry, were used in the interior of the models where rigidity was essential. Clear white pine was used for parts not likely to receive hard usage and mahogany or cherry for the exterior casing. To reduce checking and deformation, thoroughly seasoned wood was selected. The interior of the models received three to four coats of paint, containing a minimum of drier. Different materials were represented by distinctive colors. All features were given reference numbers, explained on an etched plate fastened to the model. When closed, the exterior casing protects the interior from injury. Each model can be locked and is opened by a Board of Water Supply master key.

Owing to the intricacy of the work and the numerous plans, the correlation of which required an intimate knowledge of water-supply engineering, it was realized that even an expert model-maker could not be expected to furnish models which would accomplish the aim desired, to show at a glance the location, shape and functions of inaccessible portions of the work. Assistant Engineer Herman Goldberg was therefore assigned to design and supervise the construction of the models, and it was due to his very painstaking work that such good results were obtained. There were involved the reconstruction of the entire structure in wood and the providing of movable sections which, when opened, disclosed otherwise invisible parts.

The general procedure was as follows: A cabinet-maker built the framework, supports and casing and prepared from dimensions furnished him the wood upon which the assistant engineer drafted the details of the plans. The wood was then turned over to the pattern-makers, who executed the intricate portions. The work was done at a pattern shop and was contracted for on an hourly basis, an allowance being made for the actual cost of materials. Exclusive of superintendence, the models cost from $400 to $750 each.

They are practically the first of their kind, and were made in accordance with the instructions of J. Waldo Smith, Chief Engineer of the Board of Water Supply, who has on many occasions stated his belief in the efficacy of models in working out various engineering problems. At the trial of complicated claims arising out of the construction of engineering works, involving interpretations of specifications, it has been found that models aid the court and jury to visualize the facts involved.